

Serial No. 10/643,961

January 12, 2005

Reply to the Office Action dated November 15, 2004

Page 8 of 14

REMARKS/ARGUMENTS

Claims 1-23 are pending in this application.

Claims 1-5, 8-17 and 20-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang et al. (U.S. 2002/0180035) in view of Weber (U.S. 5,609,889).

Claims 6 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang et al. in view of Weber, and further in view of Punzalan et al. (U.S.

2003/0160309). Claims 7 and 19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang et al. in view of Weber, and further in view of Cheng et al. (U.S. 2003/0075812). Applicants respectfully traverse the rejections of claims 1-23.

Claim 1 recites:

“A process for manufacturing an integrated circuit package comprising:

mounting a semiconductor die to a first surface of a substrate;

mounting a die adapter to said semiconductor die;

wire bonding said semiconductor die to ones of conductive traces of said substrate;

mounting at least one collapsible spacer to at least one of a heat spreader, said die adapter and said substrate;

placing one of said heat spreader and said substrate on a surface of a lower mold die;

releasably clamping the other of said heat spreader and said substrate to an upper mold die, such that said collapsible spacer is disposed between said heat spreader and said substrate;

molding the semiconductor die, the substrate, the wire bonds, said die adapter, said at least one collapsible spacer and said heat spreader into a molding compound by molding in a mold cavity between said other of said heat spreader and said substrate and said surface of the lower mold die, to provide a molded package;

forming a ball grid array on a second surface of said substrate, bumps of said ball grid array being electrically connected to said conductive traces; and

singulating said integrated circuit package.” (emphasis added)

Claim 13 recites features and method steps that are similar to the features and method steps recited in claim 1, including the above-emphasized features.

Serial No. 10/643,961

January 12, 2005

Reply to the Office Action dated November 15, 2004

Page 9 of 14

The Examiner alleged that Huang et al. teaches all of the features and method step recited in Applicants' claims 1 and 13, except for "placing one of said heat spreader array and said substrate array on a surface of a lower mold die." The Examiner further alleged that Weber teaches this feature. Thus, the Examiner concluded that it would have been obvious "to use the mold die of Weber with the process of Huang [et al.] in order to prevent molding material from covering the heat sink, and it allows variations in the board thickness." Applicants respectfully disagree.

Claim 1 recites the method step of "mounting at least one collapsible spacer to at least one of a heat spreader, said die adapter and said substrate." The Examiner alleged that Huang et al. teaches this step. In particular, the Examiner alleged that element 46 of Huang et al. is a collapsible spacer array, and that the alleged collapsible spacer array is mounted to a heat spreader array 43. This is clearly incorrect.

In contrast to the Examiner's allegations, element 46 of Huang et al. is specifically disclosed as being "an adhesive" that is used to attach the heat sink 43 to the buffer pad 48. Paragraph no. 43 on page 4 of Huang et al. discloses that "the buffer pad 48 is constructed to be higher than arcs of the gold wires 42, so as to prevent a first surface 430 of a heat sink 43 from contacting the gold wires 42 when attaching the heat sink 43 to the buffer pad 48 through an adhesive 46. Moreover, the buffer pad 48 helps to release a thermal stress generated from the heat sink 43 to the chip 41 at a higher temperature due to difference in thermal expansion coefficient. This makes the chip 41 not be damaged by the thermal stress, and allows heat generated by the chip 41 to be transmitted to the heat sink 43 through the buffer pad 48, while the heat is then dissipated into the atmosphere through a surface of the heat sink 43 exposed to the outside of an encapsulant 44, which encapsulates the chip 41 and the buffer pad 48."

It is absolutely clear from paragraph no. 43 on page 4 of Huang et al. that element 46 is an adhesive and not a collapsible spacer or a collapsible spacer array, as alleged by the Examiner. The adhesive 46 of Huang et al. is neither disclosed as being collapsible nor as being a spacer. Thus, Applicants respectfully submit that the

Serial No. 10/643,961

January 12, 2005

Reply to the Office Action dated November 15, 2004

Page 10 of 14

adhesive 46 of Huang et al. cannot be fairly construed as being "a collapsible spacer" as recited in Applicants' claims 1 and 13. Accordingly, Applicants respectfully submit that Huang et al. fails to teach or suggest the step of "mounting at least one collapsible spacer to at least one of a heat spreader, said die adapter and said substrate" as recited in Applicants' claims 1 and 13.

The present invention teaches the use of a collapsible spacer such that the heat spreader is pressed against the mold die during molding, so as to maintain the heat spreader in contact with the mold die and to reduce mold flash. This, in fact, is opposite to the teachings of Huang et al., since Huang et al. specifically teaches that the "combined structure is dimensioned for the gold layer 233A on the heat sink module plate 23A to be properly spaced from the top wall of the mold cavity, after engagement of the molds" (see paragraph [0036] on page 3 of Huang et al.). Thus, not only does Huang et al. fail to teach or suggest a collapsible spacer, but there also would have been absolutely no use for a collapsible spacer in the fabrication of the package as disclosed in Huang et al., since the heat sink module plate 23A of Huang et al. is specifically disclosed as being spaced away from the top wall of the mold, and cannot be in contact with the top wall of the mold.

Weber was relied upon to allegedly teach the step of "placing one of said heat spreader array and said substrate array on a surface of a lower mold die" as recited in Applicants' claim 1 and 13. However, Weber clearly fails to teach or suggest any collapsible spacer, and thus, certainly fails to teach or suggest the step of "mounting at least one collapsible spacer to at least one of a heat spreader, said die adapter and said substrate" as recited in Applicants' claims 1 and 13. Therefore, Applicants respectfully submit that Weber fails to cure the deficiencies of Huang et al. described above.

Furthermore, Applicants respectfully submit that there would have been no motivation to combine the teachings of Weber with Huang et al. Huang et al. specifically discloses that the heat sink module plate 23A must be spaced away from the top wall of the mold cavity. More particularly, paragraph no. 36 on page 3 of Huang

Serial No. 10/643,961

January 12, 2005

Reply to the Office Action dated November 15, 2004

Page 11 of 14

et al. discloses that "the combined structure of the heat sink module 23A, the chips 21 and the substrate module plate 20A is placed in the mold cavity of the molds for performing a molding process, which is used to form an encapsulant 24 for encapsulating the heat sink module plate 23A, the chips 21, the gold wires 22 and the substrate module plate 20A. As the combined structure is dimensioned for the gold layer 233A on the heat sink module plate 23A to be properly spaced from the top wall of the mold cavity, after the engagement of the molds, no cracks caused by clamping force from the molds or the heat sink module plate 23[A] will be generated for the chips 21. Further, as there is no concern for precisely controlling the height of the attachment of the heat sink module plate 23A to the chips 21, quality and reliability of the fabricated product can be assured."

Thus, not only does Huang et al. fail to teach or suggest the steps of "placing one of said heat spreader and said substrate on a surface of a lower mold die" and "releasably clamping the other of said heat spreader and said substrate to an upper mold die, such that said collapsible spacer is disposed between said heat spreader and said substrate" as recited in Applicants' claims 1 and 13, but, in fact, Huang et al. teaches away from these steps because the combined structure of Huang et al. must be dimensioned for the gold layer 233 on the heat sink module plate 23A such that the heat sink module plate 23A and the gold layer 233 (which the Examiner alleged corresponds to the heat spreader) are spaced away from the top wall of the mold cavity. In other words, the heat sink module plate 23A of Huang et al. cannot be placed on a surface of either of the upper mold or the lower mold of Huang et al.

Therefore, there would have been no motivation to modify the method of Huang et al. to include the step of "placing one of said heat spreader and said substrate on a surface of a lower mold die" as allegedly taught by Weber, because Huang et al. specifically teaches away from such a modification. The Examiner is reminded that it is error to find obviousness where references diverge and teach away from the invention at hand. W.L. Gore & Assoc. v. Garlock Inc., 220 USPQ 303, 311 (Fed. Cir. 1983).

Serial No. 10/643,961

January 12, 2005

Reply to the Office Action dated November 15, 2004

Page 12 of 14

Furthermore, it clearly would not have been obvious to modify Huang et al. as allegedly taught by Weber for the purpose of preventing the molding material from covering the heat sink, as alleged by the Examiner, because Huang et al. specifically teaches the importance of dimensioning the package and molds such that the gold layer 233 and the heat sink module plate 23A are spaced from the top of the mold.

Instead of basing the conclusion of obviousness on actual teachings or suggestions of the prior art and the knowledge of one of ordinary skill in the art at the time the invention was made, the Examiner has improperly used Applicants' own invention as a guide. It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious. The Federal Circuit has previously stated that one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. In re Fritch, 972 F.2d 1260, 23 USPQ 2d 1780, 1784 (Fed. Cir. 1992).

It is impermissible within the framework of § 103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. In re Wesslau, 353 F.2d 238, 241, 147 USPQ 391 (CCPA 1965). The Examiner has clearly done so by ignoring the specific teachings in Huang et al. which clearly preclude any modification of the method of Huang et al. that would include the step taught by Weber.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1 and 13 under 35 U.S.C. § 103(a) as being unpatentable over Huang et al. in view of Weber.

The Examiner has relied upon Punzalan et al. and Cheng et al. to allegedly cure various deficiencies of Huang et al. and Weber. However, neither Punzalan et al. nor Cheng et al. teaches or suggests the steps of "mounting at least one collapsible spacer to at least one of a heat spreader, said die adapter and said substrate," "placing one of

Serial No. 10/643,961

January 12, 2005

Reply to the Office Action dated November 15, 2004

Page 13 of 14

said heat spreader and said substrate on a surface of a lower mold die" and "releasably clamping the other of said heat spreader and said substrate to an upper mold die, such that said collapsible spacer is disposed between said heat spreader and said substrate" as recited in Applicants' claims 1 and 13.

Accordingly, Applicants respectfully submit that Huang et al., Weber, Punzalan et al. and Cheng et al., applied alone or in combination, fail to teach or suggest the unique combination and arrangement of method steps and features recited in Applicants' claims 1 and 13.

In view of the foregoing remarks, Applicants respectfully submit that Claims 1 and 13 are allowable. Claims 2-12 and 14-23 depend upon claims 1 and 13, and are therefore allowable for at least the reasons that claims 1 and 13 are allowable.

In view of the foregoing remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

Serial No. 10/643,961

January 12, 2005

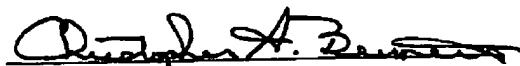
Reply to the Office Action dated November 15, 2004

Page 14 of 14

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

Date: January 12, 2005



Attorneys for Applicant

Joseph R. Keating
Registration No. 37,368

Christopher A. Bennett
Registration No. 46,710

KEATING & BENNETT LLP
10400 Eaton Place, Suite 312
Fairfax, VA 22030
Telephone: (703) 385-5200
Facsimile: (703) 385-5080